

Apeiron Space Integration System, Phase I

Completed Technology Project (2018 - 2019)



Project Introduction

Based on lessons learned from previously-funded SBIR work for DARPA on in-space robotic reconfiguration and utilization of existing flight-rated structures, Made In Space, Inc. (MIS) proposes the Apeiron Space Integration System to meet NASA requirements for a modular assembly and integration architecture that enables the routine expansion, upgrade, and refurbishment of persistent robotic platforms in Low Earth Orbit (LEO) at the module and submodule level. Apeiron utilizes a common adapter port, autonomous robotic integration and payload hosting, and a sub-module pallet system to create reconfigurable long-duration space platforms from modules that fit within existing launch vehicle envelopes.

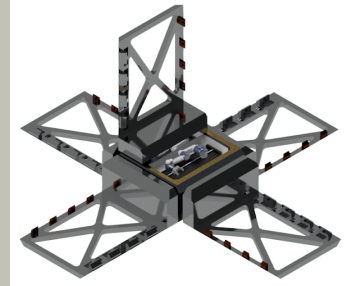
By using form factors compatible with existing launch architectures and available autonomous assembly technology, the Apeiron Space Integration System enables a wide variety of platform configurations to be cost-effectively and rapidly deployed by a variety of existing launch vehicles. For example, Apeiron can create a LEO Small Payload Station from the excess capacity on a single EELV flight.

Flights carrying ESPA rings launch on average every two months. The Apeiron system is capable of seeding Small Payload Stations in every orbit these flights reach. This enables rapid and cost-effective construction and commissioning of autonomous persistent platforms in LEO from mass that would otherwise be discarded, enabling a wide variety of remote sensing, science, and communications payloads to be flown at a much lower cost.

Anticipated Benefits

A persistent Science Station based on the Apeiron system enables NASA scientists across the mission directorates to fly technology demonstration payloads, small instruments, and dedicated missions without the additional cost of integrating the support subsystems and satellite bus required for dedicated free-flyer missions. This approach continues the lessons learned with external payload hosting on the ISS, but eliminates the requirements imposed by operation on a human-tended platform.

The Apeiron System provides persistent access to the LEO environment and microgravity for automated payloads and systems. MIS will work with industry partners, such as NanoRacks, Alpha Space, and Teledyne Brown Engineering to identify existing customers that can transition to a Apeiron-based Commercial Science Station and develop the accommodations necessary to ensure continuity of business operations.



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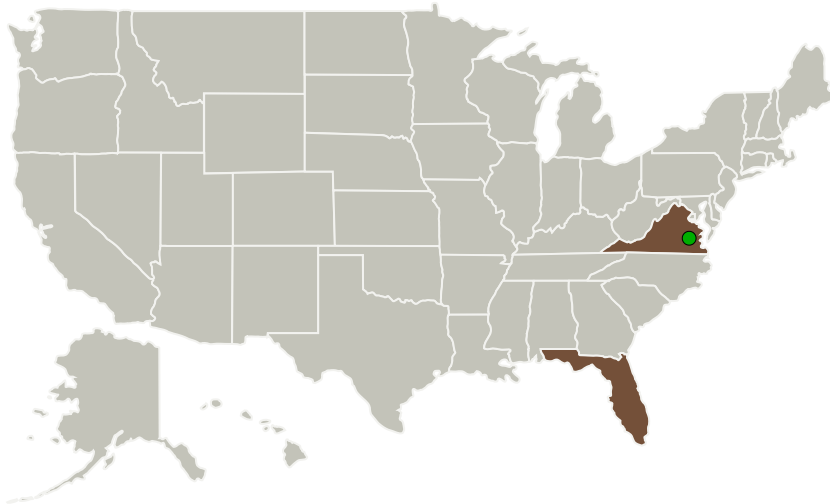
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Made in Space, Inc.	Lead Organization	Industry	JACKSONVILLE, Florida
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Florida	Virginia
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Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/141267>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Made in Space, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

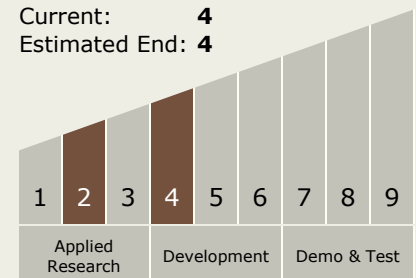
Carlos Torrez

Principal Investigator:

Michael Snyder

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4

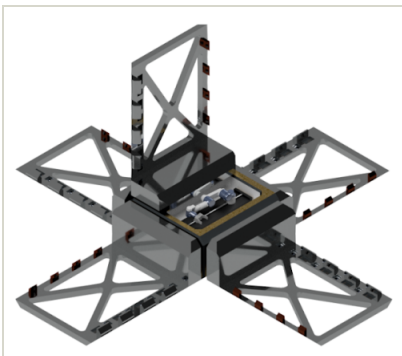


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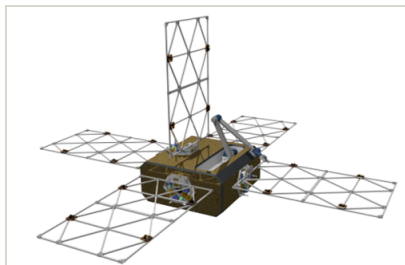


Images



Briefing Chart Image

Apeiron Space Integration System,
Phase I
(<https://techport.nasa.gov/image/127856>)



Final Summary Chart Image

Apeiron Space Integration System,
Phase I
(<https://techport.nasa.gov/image/133138>)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.1 Manufacturing Processes

Target Destination

Earth